

# Method for detection of auditory evoked potentials using a point optimized variance ratio

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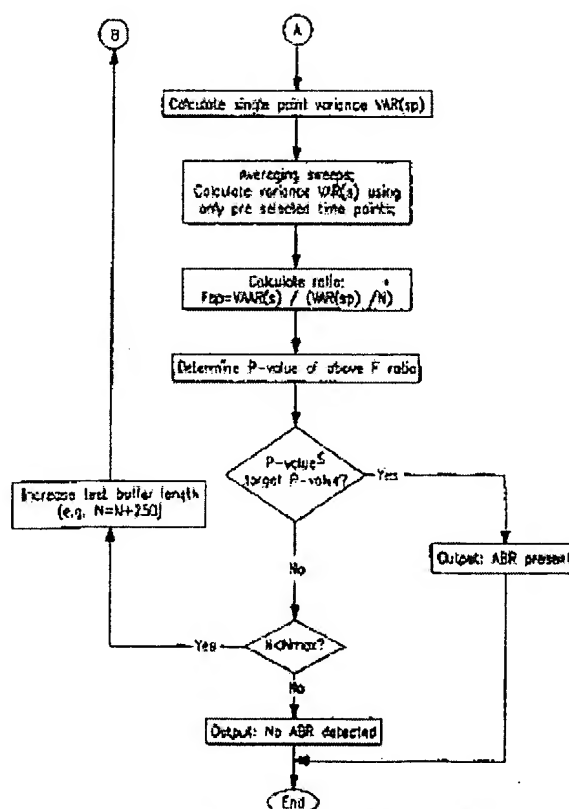
WO0064351 (A1)  
EP1089659 (A1)  
US6196977 (B1)  
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Abstract not available for JP2002541965T

Abstract of corresponding document: **US6196977**

A method for determining the statistical probability that an auditory brainstem response (ABR) to an acoustic stimulus is present in a human test subject. The method employs an algorithm that provides a continuously evolving estimate of the probability of ABR presence as acquired data accumulates. The algorithm employs a radical modification of a conventional FSP approach.



\* All variances and ratios are accumulative, recalculated after each block of sweeps.

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## Method for detection of auditory evoked potentials using a point optimized variance ratio

Claims of corresponding document: **US6196977**

What is claimed is:

1. A method for gathering and analyzing ABR signal data generated in response to auditory stimuli to determine hearing capacity of an individual based on a ratio of the variance of average ABR data at specific time points specified by a target waveform to the variance of data at fixed points in time from single sweeps that will form the average, comprising the steps of:
  - (a) generating a plurality of auditory stimuli;
  - (b) presenting said auditory stimuli to a test subject's ear;
  - (c) collecting electrophysiologic signal data from the test subject within a sweep following each of a specified number of said auditory stimuli;
  - (d) computing a cumulative variance of data at predetermined points in time across individual sweeps;
  - (e) computing a cumulative test subject average waveform from said collected electrophysiologic signal data;
  - (f) computing a variance of selected points on said cumulative test subject average waveform;
  - (g) computing a variance ratio with the variance computed in (f) as numerator and variance computed in (d) as denominator;
  - (h) computing a probability value associated with said ratio;
  - (i) continuing steps (a) through (h) adding to the cumulative test subject average waveform and single sweep data if said computed probability value exceeds a predetermined threshold and declaring that the test subject responded to the auditory stimulus if the computed probability value is below said predetermined threshold; and
  - (j) terminating steps (a) through (h) and declaring that no response is present if a predetermined number of stimuli have been presented without the computed probability value falling below the predetermined threshold.
2. The method of claim 1 wherein the probability value computed in step (h) is based on standard F tables.
3. The method of claim 1 wherein the selected points in step (f) comprise a subset of points on the target waveform having a non-zero response.
4. The method of claim 3 further comprising the step of selecting said selected points by:
  - (i) selecting maximum and minimum values on a target waveform as first and second points;
  - (ii) computing a maximum n-point signal variance for a plurality of candidate n<sup>th</sup> points;
  - (iii) selecting as an n<sup>th</sup> point one of the plurality of candidate n<sup>th</sup> points yielding maximum variance;
  - (iv) repeating steps (ii) and (iii) to select additional points until the maximum variance determined in step (iii) is below a predetermined threshold.
5. The method of claim 4 wherein the plurality of candidate n points are constrained to be no closer than a predetermined time value to any of the previously selected n-1 points.
6. A system for gathering and analyzing ABR signal data generated in response to hearing stimuli to determine hearing capacity of an individual based on a ratio of the variance of average ABR data at specific time points specified by a target waveform to the variance of data at fixed points in time from single sweeps that will form the average comprising:
  - (a) means for generating a plurality of auditory stimuli;
  - (b) means for presenting said auditory stimuli to a test subject;
  - (c) means for collecting electrophysiologic signal data from the test subject within a time window following each of a specified number of said auditory stimuli;
  - (d) means for computing a cumulative variance of data at predetermined points in time across individual sweeps;
  - (e) means for computing a cumulative test subject average waveform from said collected electrophysiologic signal data;
  - (f) means for computing a variance of selected points on said cumulative test subject average waveform;
  - (g) means for computing a variance ratio with the variance computed by (f) as numerator and variance computed by (d) as denominator;

- (h) means for computing a probability value associated with said ratio;
- (i) means for iteratively operating (a) through (h) adding to the cumulative test subject average waveform and single sweep data if said computed probability value exceeds a predetermined threshold and declaring that the test subject responded to the auditory stimulus if the computed probability value is below said predetermined threshold; and
- (j) means for terminating operation of (a) through (h) and declaring that no response is present if a predetermined number of stimuli have been presented without the computed probability value falling below the predetermined threshold.

7. The system of claim 6 wherein the probability value computed by (h) is based on standard F tables.

8. The system of claim 6 wherein the means for computing a variance of selected points computes a variance of a subset of points on the target waveform having a non-zero response.

9. The system of claim 8 further comprising means for selecting said selected points by:

- (i) selecting maximum and minimum values on the target waveform as first and second points;
- (ii) computing a maximum n-point signal variance for a plurality of candidate n<sup>th</sup> points;
- (iii) selecting as an nth point one of the plurality of candidate n<sup>th</sup> points yielding maximum variance;
- (iv) repeating steps (ii) and (iii) to select additional points until the maximum variance determined in step (iii) is below a predetermined threshold.

10. The system of claim 9 wherein the plurality of candidate n<sup>th</sup> points are constrained to be no closer than a predetermined time value to any of the previously selected n-1 points.

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